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Efficient channel estimation for chip multiuser detection on underwater acoustic channels

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Abstract:

Two different single-element synchronous downlink multiple access schemes, interleave division multiple access (IDMA) and code division multiple access (CDMA) in conjunction with channel estimation, are considered for underwater communications channels. The proposed hard/soft chip channel estimation and carrier phase tracking are jointly optimized based on the mean square error (MSE) criterion and adopted iteratively by the reconstructed multiple access interference (MAI) signal, which is generated using exchanged soft information in terms of log-likelihood ratio (LLR) estimates with the single-users' channel decoders. The performance of the proposed receiver structures are investigated and compared in short range shallow water acoustic channels. Results for synchronous multiuser scenarios with 2 users, using quadrature phase-shift keying (QPSK) at an effective rate of 439.5 b/s per user, demonstrate significant performance improvement in both systems, and the IDMA performance outperforms long-code CDMA and short-code CDMA in most configurations.

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